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EXAMINER	
SLAWSKI, BRIAN R	

ART UNIT	PAPER NUMBER
1791	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/584,352	KIKUCHI ET AL.	
	Examiner	Art Unit	
	BRIAN R. SLAWSKI	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *09 September 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

METHOD OF MANUFACTURING FLEXIBLE LAMINATE SUBSTRATE

Detailed Action

1. Applicant's request for reconsideration filed on September 9, 2008, was received. Claim 1 was amended.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in the Office action mailed on December 19, 2007.

Claim Rejections—35 USC §112

3. The rejections of claims 1-6 as being indefinite under 35 U.S.C. 112, second paragraph, are withdrawn because claim 1 has been amended.

Claim Rejections—35 USC §103

4. Claims 1-3, 5, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hase et al. (WO01/32418) in view of Fukada (US 2002/0108709). (Subsequent references to Hase et al. are based on the corresponding U.S. Patent No. 7,101,455).

Regarding Claim 1, Hase et al. teach a method of manufacturing a flexible laminate substrate 6 for a flexible circuit board, including copper foils 1 bonded onto at least one surface of a heat-resistant thermoplastic polyimide adhesive film 2. The laminate is thermally bonded via a protective film 3 between one or more pairs of metal rolls 4, after which the protective film is peeled off around peeling assistant rolls 8 (Abstract ; Fig. 1(a); col. 1, L. 25-31 ; col. 2, L. 8-19; col. 8, L. 16-37).

Hase et al. explain that when the copper foil and polyimide adhesive film are thermally laminated between the metal rolls, the polyimide film expands faster under tension than the copper foil due to its greater coefficient of thermal expansion, and then shrinks faster than the copper foil during cooling, causing wrinkling of the laminate (col. 3, L. 11-31; col. 7, L. 38-53). Hase et al. further teach that the thermoplastic polyimide adhesive film must heated above its glass transition temperature (T_g) by the metal rolls to become tacky and bond to the metal foils, and that the laminate retains heat after lamination such that the polyimide adhesive film remains in a state of flux, which can contribute to wrinkling; hence the laminate is forcibly cooled after passing the metal rolls so that its temperature is preferably not higher than its T_g when the protective film is peeled (Fig. 2; col. 1, L. 59-67; col. 2, L. 1-7; col. 5, L. 46-49; col. 7, L. 54-60; col. 8, L. 29-39, L. 49-52, L. 61-65; col. 9, L. 3-5; col. 11, L. 9-18) Hase et al. teach that wrinkling of the laminate can be minimized by reducing tension on the materials before lamination to the minimum needed for the webs to stably proceed (col. 3, L. 11-21; col. 5, L. 32-38; col. 11, L. 39-42). While Hase et al. do not specifically describe the tension on the laminate after passage through the metal rolls, one of ordinary skill in the art would have recognized from these teachings that the polyimide adhesive film would remain in a fluid state, being above its T_g, after leaving the metal rolls, and hence would be subject to elongation under tension and subsequent wrinkling as the laminate's materials then cool and shrink at different rates. Thus it would have been obvious to one of ordinary skill in the art to apply minimal tension on the laminate of Hase et al. immediately after passage between the metal rolls to avoid wrinkling the laminate.

Hase et al. do not specifically describe the tension applied to the laminate during peeling of the protective films 3 either. However, Fukada teaches that when an external laminated film 4 is continuously peeled from a moving web 1 around a peeling roller 3, tension must be applied to the web 1 in order to stably transport the web 1 and stably separate the waste matrix 4. Fukada teaches that one possible means of applying this tension is with an upstream brake roller 8 that opposes the downstream driven roller 7 advancing the moving web 1 (Fig. 1, 2; [0007-0008]).

Therefore, it would have been obvious to one of ordinary skill in the art to apply greater tension to the laminate of Hase et al. during delamination of the protective film than after passage between the metal rolls, because the teachings of Hase et al. would inform the skilled artisan that minimal tension should be applied to the laminate immediately after passing the metal rolls to avoid wrinkling the laminate, while Fukada et al. teach that an advancing web must be tensioned if it is to remain stable when diverting and peeling a laminated film therefrom.

Regarding Claim 3, the combination of Hase et al. and Fukada does not specifically teach a tension on the laminate from 50 N/m to 500 N/m inclusive during the delamination of the protective film. However, Fukada recognizes that the amount of tension applied to an advancing web when diverting and peeling an adhered film therefrom will determine whether or not the web remains stable, as described above. In view of these teachings, it would have been within the level of ordinary skill in the art to adjust the tension applied to the laminate of Hase et al. during the delamination of the protective film, in order to ensure the stable propagation of the laminate. Discovery of

the optimum value of a result-effective variable in a known process is ordinarily within the skill of the art. In re Boesch, CCPA 1980, 617 F.2d 272,205 USPQ215.

Regarding Claim 3, Hase et al. do not specifically teach a tension on the laminate from 10 N/m to 200 N/m inclusive after the passage between the metal rolls. However, Hase et al. recognize that the amount of tension applied to the laminate during the adhesion process is important, teaching that the tension must be sufficient to enable stable propagation of the materials but that too much tension can cause distortion of the laminate due to different rates of expansion of the copper foil and polyimide film, as described above. In light of these teachings, it would have been within the level of ordinary skill in the art to determine the level of tension on the laminate after passage between the metal rolls needed to ensure steady propagation without wrinkling the laminate. Discovery of the optimum value of a result-effective variable in a known process is ordinarily within the skill of the art. In re Boesch, CCPA 1980, 617 F.2d 272,205 USPQ215.

Regarding Claim 5, Hase et al. teach bringing the temperature of the laminate below the glass transition temperature of the thermoplastic resin adhesive film before peeling the protective film, as the protective film does not peel off easily at high temperature (col. 11, L. 9-20).

Regarding Claim 6, Hase et al. teach the use of a protective polyimide film that is non-thermoplastic (col. 4, L. 66-67; col. 5, L. 1-3).

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hase et al. and Fukada as applied to Claims 1-3, 5, and 6 above, and further in view of Yamamoto et al. (US 4,865,675).

Hase et al. do not explicitly teach regulating the tension after the passage between the metal rolls and before delamination using nip rolls. However, it would have been obvious to one of ordinary skill in the art to minimize the tension on the laminate immediately after its passage through the metal rollers, to avoid distortion from the materials' different rates of thermal expansion, and to apply more tension on the laminate during peeling of the protective films, as described in paragraph 4 above. Hase et al. further teach an embodiment in which the laminate passes through multiple pairs of nip rolls 4a before delamination of the protective film (Fig. 4; col. 14, L. 56-65).

Yamamoto et al. teach a method of laminating a plurality of webs in the nip between hot press rollers R1, wherein, similarly, different rates of thermal expansion of the webs can cause curl or wrinkling of the laminate (see Fig. 1 ; col. 2, L. 21-28; L. 38-40). Yamamoto et al. teach that this wrinkling can be avoided by passing the laminate back and forth between the hot press rollers via delivery rollers R2 and R3, where the circumferential speeds of the pairs of rollers are controlled so as to regulate the tension on the laminate (col. 3, L. 16-37). It would have obvious to one having ordinary skill in the art to regulate the tension on the laminate between the metal rolls and delamination of Hase et al. using nip rolls, because Hase et al. in view of Fukada teach that the tension on the laminate should be controlled in this segment to prevent wrinkling but

keep the laminate traveling stably, while Yamamoto et al. teach that nip rolls are an effective means of regulating tension in a traveling laminate.

Response to Arguments

6. Applicant's arguments filed on September 9, 2008, have been fully considered but they are not persuasive. Applicant argues that the rejections of claims 1-3, 5, and 6 under 35 U.S.C. 103(a) as being unpatentable over Hase et al. in view of Fukada, and of claim 4 under 35 U.S.C. 103(a) as being unpatentable over Hase et al. and Fukada in view of Yamamoto et al., are improper because, despite teaching that the tension acting on the laminating materials before lamination should be the minimum needed for the materials to stably proceed, Hase et al. do not teach the tension applied to the laminate after passage between the metal rolls. The examiner agrees that Hase et al. do not explicitly teach the relative levels of tension on the laminate after passing the metal rolls and during delamination. However, Hase et al. teach that the laminate is susceptible to wrinkling because the adhesive film expands faster than the copper foils during thermal lamination under tension, then shrinks faster than the copper foils during cooling; that the resulting wrinkling can be minimized by applying the least tension possible to the laminating materials; and that, because it stays above its glass transition temperature, the adhesive film remains in a fluid state and therefore is prone to wrinkling immediately after lamination (see p. 7, L. 54-60). One of ordinary skill in the art would have recognized from these teachings that minimal tension should be applied to the laminate

immediately after lamination, to prevent the fluid adhesive film from elongating and the laminate from wrinkling as it cools and shrinks back.

Applicant further argues that, because Fukada is directed to a process for peeling a waste matrix from labels while Hase et al. is directed to making a flexible circuit board, one of ordinary skill in the art would not have been motivated to apply the teachings of Fukada to the process of Hase et al. This is not found persuasive because the process of Fukada is clearly analogous to the peeling step in Hase et al., in which a laminated outer film is continuously peeled around a peeling roller from a flexible moving web. Fukada simply teaches that the moving web must be tensioned in order to propagate stably as the film is peeled . One of ordinary skill in the art would have recognized the mechanical equivalence of the peeling processes of Fukada and Hase et al., and that the problem of an insufficiently tensioned moving web being destabilized by peeling a film therefrom would hold true not merely for the specific materials and process of Fukada, but would occur in any similar peeling process including that of Hase et al. The examiner therefore maintains that, in light of the combined teachings of Hase et al. and Fukada, it would have been obvious to one of ordinary skill in the art to apply greater tension to the laminate of Hase et al. during delamination of the protective films than after the laminate has passed between the metal rolls.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRIAN R. SLAWSKI whose telephone number is (571)270-3855. The examiner can normally be reached on Monday to Thursday, 7:30 a.m. to 5:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino, can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Brian R. Slawski/
Examiner, Art Unit 1791

/Jeff H Aftergut/
Primary Examiner, Art Unit 1791

B.R.S.